

**METHOD AND APPARATUS FOR MEASURING THE ACCELERATION
OF AN ENGINE**

1 BACKGROUND OF THE INVENTION

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3 The present invention relates to an apparatus and
4 method of measuring the acceleration of an engine and
5 especially to a method of measuring acceleration of an
6 engine under selected loads to simulate a racetrack's
7 length.

8 This invention relates to an apparatus and method
9 for measuring acceleration that is particularly
10 suitable for testing race car engines and matching the
11 engine to the car for a particular racetrack and the
12 engine can be used to measure elapsed time at
13 preselected RPMs under selected loads to simulate
14 racetrack lengths. Normally, engines are tested on
15 dynamometers by mounting the engine on a test stand
16 and running the engine so as to measure the output
17 shaft power or torque under controlled conditions.
18 The dynamometer provides a means of absorbing the
19 energy developed by the prime mover and for measuring
20 the output energy. Instruments are connected to
21 different portions of the engine in order to supply
22 information with respect to temperature of different
23 parts, pressures in the intake manifold or combustion
24 chambers of an internal combustion engine, back
25 pressure at the exhaust and the like. Dynamometers are
26 costly and delicate devices which must be maintained
27 in good operating condition for proper operation and
28 interpretation of test data.

29 Prior U.S. Patents can be seen in the Roberts
30 patent, No. 2,362,308, for an Apparatus for Testing
31 Prime Movers which connects a prime mover to a shaft
32 which can have the rear end loaded with weights

1 hanging from the shaft on a radial arm. The Lucia
2 U.S. patent, No. 3,505,863, is a Method and Apparatus
3 for Testing the Acceleration of Prime Movers in which
4 the output shaft is coupled to a flywheel of known
5 inertia which is driven and accelerated from a first
6 predetermined angular velocity to a second
7 predetermined velocity. The time taken for
8 accelerating the flywheel is measured and the average
9 torque developed by the prime mover is derived from
10 the time taken to accelerate the flywheel. The
11 invention includes a test stand in which the prime
12 mover may be tested while a second prime mover is
13 being installed or connected and for comparing the
14 torque developed by a prime mover to the torque of a
15 reference prime mover.

16 The Kay et al. U.S. patent, No. 4,691,288, is a
17 Torque Sensor for Internal-Combustion Engines. A
18 method and apparatus for providing a signal
19 representative of the output torque of an internal
20 combustion engine utilizes a correlation of average
21 engine speed and variations in instantaneous sub-
22 cyclic engine speed. The R.R. De Zurik U.S. patent,
23 No. 3,285,057, is an Apparatus for Obtaining Torque
24 Measurements, such as a torsional forces applied to a
25 constantly rotating shaft. The Shmutter et al. U.S.
26 patent, No. 4,758,967, is a Computer Simulated Inertia
27 for Motor Vehicle Powertrain Testing and includes an
28 output motor driven shaft having an inertia disc
29 mounted thereto in an output motor in order to
30 simulate normal driving conditions in a test stand.

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1 SUMMARY OF THE INVENTION

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3 An apparatus for measuring the acceleration of an
4 engine for use in a race car for matching the engine
5 to the car for a particular racetrack and includes an
6 engine test stand having a base and an inertia shaft
7 mounted thereto coupled to a gear box. The test stand
8 includes an engine cart for mounting the engine
9 thereto and positionable for coupling the engine to
10 the gear box and has a plurality of selectively
11 engageable inertia wheels attached thereto. The
12 method includes mounting an engine to the engine cart
13 and positioning the engine cart for alignment with the
14 clutch system coupling the engine to the gear box.
15 The engine is then accelerated through a predetermined
16 RPM range so that measurements of elapsed time at
17 preselected RPMs can be determined and a selected load
18 to simulate a racetrack length.

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20 BRIEF DESCRIPTION OF THE DRAWINGS

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22 Other objects, features, and advantages of the
23 present invention will be apparent from the written
24 description and the drawings in which:

25 Figure 1 is a perspective view of an apparatus
26 for measuring the acceleration of an engine and
27 attached engine;

28 Figure 2 is a perspective view of a portion of
29 the apparatus of Figure 1 showing the inertia wheels;

30 Figure 3 is a side elevation of the apparatus for
31 measuring the acceleration of an engine; and

32 Figure 4 is a sectional view taken through one
33 section of the inertia wheels.

1 DESCRIPTION OF THE PREFERRED EMBODIMENT

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3 Referring to the drawings Figures 1-4, an
4 acceleration measuring apparatus 10 has an engine 11
5 mounted thereto in Figure 1. The engine is mounted to
6 an engine cart 12 which has wheels 13 to roll the cart
7 12 and the engine 11 into position for attaching the
8 engine to the acceleration measuring apparatus 10.
9 The cart 12 has an aligning cone 14 shown in Figure 3
10 which is pushed into an opening in the supporting base
11 frame 15 for aligning the cart in a proper position
12 for attaching the crank shaft of the engine 11 to the
13 drive shaft of the acceleration measuring apparatus
14 10. The acceleration measuring apparatus 10 base 15
15 has general support frame members 16 supporting a
16 plurality of journals 17 which in turn supports an
17 inertia wheel supporting shaft 18. The inertia
18 supporting shaft 18 holds a plurality of inertia
19 wheels 20 aligned in two banks, as seen in Figure 2.
20 The inertia supporting shaft 18 is in turn connected
21 to a gear box 21 which is connected to the shaft
22 coupling 22 which in turn allows a connection to the
23 engine 11 crank shaft. An exhaust pipe 23 has been
24 connected to the engine header 24 so as to feed the
25 exhaust gases from the room in which the engine is
26 being tested. The inertia wheel housing 24 has an
27 inertia wheel cover 25 which is shown in Figure 1 and
28 in an open position in Figure 2 exposing the inertia
29 wheels 20. The number of inertia wheels 20, as seen
30 in Figure 4, can include a plurality of main wheels
31 26, which are always fully engaged to the shaft, and
32 a plurality of floating inertia wheels 27, all mounted
33 to the inertia wheel shaft 18 and selectively

1 engageable thereto and having a plurality of elongated
2 bolts 28 extending through the floating inertia wheels
3 27 and the main inertia wheels 26. The floating
4 inertia wheels are readily engaged or disengaged to
5 the other wheels in order to adjust the inertia placed
6 on the shaft 18. The shaft 18 is connected through
7 the gear box 21 and couplings to the engine 11 so that
8 the engine 11, when running, produces a rotation of
9 the crank shaft which rotates the inertia wheels 20
10 which simulate a load through a chosen RPM range for
11 recording the elapsed times at various RPM points.
12 The inertia wheels are engaged or disengaged from the
13 shaft 18 to simulate different race tracks lengths so
14 that the engine can be matched to a race car for
15 different race tracks. An air gap 30 is positioned
16 between the floating inertia wheels 27 and the main
17 inertia wheels 26 to allow the floating or slipping of
18 the floating wheels on the shaft 18. A plurality of
19 sensors 31 are connected to the output of the crank
20 shaft of the engine 11 and can be connected to the
21 engine as desired for measuring velocity acceleration
22 specifically for recording elapsed times and various
23 RPM points. The inertia wheels can then selectively
24 engaged or disengaged to simulate a specific race
25 track length for race tracks so that the engine can be
26 easily tested prior to mounting in a vehicle to
27 simulate the combination of an engine with a
28 particular racing vehicle and race track.

29 In operation, the engine 11 is mounted to an
30 engine cart 12 and is then aligned and connected to
31 the acceleration testing apparatus 10 with the exhaust
32 pipe 23 connected to the headers 24 of the engine 11.
33 The inertia wheels 20 are then selectively engaged or

1 disengaged to adjust the inertia for a particular
2 vehicle that the engine is to be placed in. The
3 engine is then started and accelerated through a
4 predetermined RPM range simulating a particular race
5 track and measuring the elapsed times and preselected
6 RPMs so that the acceleration of the engine can be
7 recorded under selected loads to simulate race track
8 lengths.

9 It should be clear at this time that an apparatus
10 and a method of measuring the acceleration of an
11 engine have been provided for modifying an engine to
12 a specific vehicle for use on a specific length of
13 race track. However, the present invention should not
14 be considered as limited to the forms shown which are
15 to be considered illustrative rather than restrictive.